

## **Chapter 6.5 PUBLIC HEALTH/AQUATIC LIFE CONCERNS**

Increasingly, the DEQ is addressing the role toxicants play in reducing water quality in state waters and supports programs to monitor, evaluate, and reduce toxicity to aquatic life and human health. Many of the programs in place at DEQ that address toxicity in state waters are described and discussed throughout this report.

The toxic pollutants that were monitored during the reporting period include toxic organics, metals and pesticides. Information on the state's monitoring programs and the results of this monitoring for toxics in water column, fish tissue, and sediment is provided in Chapter 2.1 of this report. A discussion of the methodology used to determine elevated levels of toxicants is provided in Chapter 2.2.

### **Fish Consumption Advisories and Restrictions**

Currently, the Virginia Department of Health (VDH) [Division of Public Health Toxicology](#) has 54 health advisories in effect. One of these advisories prohibits fish consumption and the other 53 recommend limiting fish consumption in the affected areas. A fishing restriction allows sport fishing within the affected area, but the taking of fish for human consumption is prohibited. A health advisory warns of potentially dangerous levels of contamination found in fish tissues in an affected area and, in most cases, limits consumption but does not prohibit it. Under health advisories, the population at risk and a safe maximum consumption rate may be specified. All VDH fish consumption advisories for mercury and PCBs caution that women who are pregnant or may become pregnant, nursing mothers and young children should not eat any fish from affected waters to avoid ingesting contaminants. Contamination of fish by three toxic pollutants – (kepone, mercury, and polychlorinated biphenyls (PCBs)) - have been the causes of the health advisories that are currently in place throughout the state. While only four of the health advisories were the result of accidental industrial releases of toxic contaminants to the aquatic environment, the contributing sources of contamination for the remainder of the advisories remain undetermined. However, DEQ continues to investigate potential contributing sources for PCBs in a number of watersheds. The health advisories and affected watersheds are described below.

- **Kepone and PCBs in the Lower James River**

From 1966 through 1975, Allied Chemical Company and its subsidiary Life Science Products, Inc. produced a persistent chlorinated hydrocarbon insecticide called Kepone. During production, an estimated 90,720 kg of Kepone was released to the environment through atmospheric emissions, wastewater discharges, and bulk-disposal of off-specification batches. The James River and its tributaries from Richmond to Newport News were contaminated with Kepone. In 1975, the entire James River from the fall line at Richmond to the Hampton Roads/Norfolk Bridge Tunnel, including all tributaries, was closed to the taking of any shellfish and/or finfish because of Kepone. From 1975 through 1988, various Kepone bans were in place. In 1988, all James River fishing restrictions due to Kepone were allowed to expire as Kepone levels in fish remained below the U.S. Food and Drug Administration (FDA) action level of 0.30 parts per million (ppm). This area, covering the main stem James River and all tributaries from the fall line at Richmond to the Hampton Roads-Norfolk Bridge Tunnel, is currently under a contaminant advisory. This advisory does not limit or restrict the consumption of fish from this part of the river. However, a more stringent consumption advisory due to PCBs has been in place since 2002 for portions of the same segment. The current fish consumption advisory due to PCBs contamination recommends that no more than two eight-ounce meals per month of a number of fish species should be consumed from these waters. Additionally, the advisory recommends that carp, gizzard shad and blue catfish greater than 32 inches in length and flathead catfish greater than 32 inches in length should not be eaten from these waters. The watersheds affected by this health advisory are located within VAP-G01 through VAP-G09, VAT-G10 through VAT-G15, and VAP-J15.

DEQ has continually monitored Kepone levels in the James River since its identification in 1975. The major areas of concern were Kepone levels in the water column, finfish, and sediment of the James River and its tributaries, and in the ground water in Hopewell. After continuous non-detectable results, water column monitoring was discontinued in 1981. Kepone levels in finfish, ground water, and sediment have decreased since the onset of the problem. The VDH has established a level of concern of 0.30 ppm Kepone in fish-filet samples. No fish-filet samples from this section of the James River have exceeded this level since 1996.

- **Fish consumption advisories due to mercury contamination of fish**

There are 20 health advisories that have been issued by the VDH due to mercury contamination of fish throughout the state. Two of these advisories were related to known industrial releases and the sources of the remainder of contaminated watersheds are unknown at this point. DEQ is investigating possible and suspected sources in the affected watersheds. Mercury is released into the environment by both natural sources and pollution. Biological processes transform mercury in the water into more toxic methylmercury. Fish absorb methylmercury directly from water, sediment and from eating smaller aquatic organisms that contain methylmercury.

Prior to 2001, VDH followed guidelines developed by the FDA that considered methylmercury levels higher than 1.0 ppm in exceedence of safety guidelines. In 2001, the VDH began to use a concentration of 0.5 ppm methylmercury in fish tissue as the guideline for issuing a fish consumption advisory statewide. The revised fish consumption guidelines for mercury contamination were based on an extensive review of literature by the National Academy of Sciences which indicated that lowering the amount of mercury recommended for fish consumption would provide more protection for the public. This lower concentration of 0.5 ppm is also based on assuming a fish consumption rate of two eight-ounce meals per month as an exposure rate for triggering a fish consumption advisory. This fish consumption rate is a greater rate of consumption than what is used as the basis of the Virginia water quality criteria (6.5 g/day, or about one eight-ounce meal per month). The fish tissue value for mercury which is based Virginia water quality standard (WQS TV) is higher at 1.1 ppm. Although some species of fish in waters of the state exceed the VDH level of concern of 0.5 ppm, most fish samples do not exceed the Virginia WQS TV of 1.1 ppm. Prior to 2001, mercury concentrations in fish at 1.0 ppm or below would not have resulted in fish consumption advisory. This new, lower concentration of concern for mercury used by the VDH has increased the number of watersheds subject to fish consumption advisories due to mercury contamination. The watersheds covered by fish consumption advisories due to mercury contamination are described below.

- Mercury in the North Fork Holston River

Eighty miles of the North Fork Holston River in southwestern Virginia from Saltville to the Virginia-Tennessee state line were contaminated with mercury by releases from the Olin manufacturing operation in Saltville. Although the chemical plant closed in 1972, mercury levels in fish in this section of the river remain elevated above levels seen upstream and the consumption of fish from this area is prohibited. Since 1974, only catch and release fishing has been allowed. Several species of fish in these waters show mercury concentrations higher than the VDH's level of concern of 0.5 ppm as well as the DEQ Water Quality Standards based fish tissue value (WQS TV) of 1.1 ppm. This health restriction affects the following watersheds VAS-O13, VAS-O12, VAS-O11, and VAS-O10.

- Mercury in the South River, South Fork Shenandoah River, North Fork Shenandoah River and Shenandoah River

Mercury was released by E. I. DuPont de Nemours and Company, a synthetic fibers plant in Waynesboro, into the South River and South Fork Shenandoah River from 1929 to 1950. The contamination was discovered in 1977 and was found to have contaminated more than 100 river miles from the plant to the Page/Warren county line. These areas remain under health advisories for fish consumption due to mercury contamination. The advisory was updated in 2001 as follows. For the South River, the VDH recommends that no fish, other than stocked trout, should be eaten from the footbridge at the DuPont plant in Waynesboro downstream to the confluence with the North River at Port Republic. For the South Fork Shenandoah River, the VDH recommends that no more than two eight-ounce meals (1/2 pound) per week of fish from these waters be consumed from Port Republic to the Riverton dam on the North Fork Shenandoah River and downstream in the Shenandoah River to the Warren Power dam just north of Front Royal. A concurrent advisory issued in 2004 due to PCB contamination of part of the segment recommends no consumption of channel catfish, carp or sucker species. Several species of fish in these waters show mercury concentrations higher than the VDH's level of concern of 0.5 ppm as well as the DEQ WQS TV of 1.1 ppm. This health advisory is located in all or a portion of watersheds, VAV-B40, VAV-B38, VAV-B37, VAV-B35, VAV-B33, and VAV-B32.

- Mercury in swamp waters, lakes, impoundments, and other waters

In October 2003, the VDH established fish consumption advisories due to elevated mercury levels detected in fish tissue in top level predator fish species for three swamps or “blackwater” rivers where there are no known significant anthropogenic sources of mercury contamination. Subsequent monitoring in other swamp influenced bodies of water has resulted in additional fish consumption advisories being established in other watersheds since 2003. These water bodies share similar natural, chemical and physical characteristics of low dissolved oxygen, low pH, high organic content and still or slow moving current which promote the natural methylation of mercury into the highly bioaccumulative compound methylmercury. In recent years, a better understanding has developed that waterbodies with these environmental conditions are likely to promote the conversion of elemental mercury into the toxic form methylmercury which is more easily bioaccumulated into fish tissue in these waters. Increased natural production of methylmercury in these waters enhances the possibility that the mercury content of fish will increase especially in upper level predators. Similar elevated levels of mercury in piscivorous species of fish have been noted in similar habitats in the southeastern United States as well as lakes, bogs and wetlands in New England, Wisconsin and Minnesota. In many of these areas, there are no known sources of mercury. Deposition of airborne mercury has been identified as a possible source of the mercury to the swamp waters. This is considered a possibility in swamp waters in Virginia also. DEQ is investigating air deposition of mercury and other potential sources of mercury to these water bodies. DEQ has initiated additional monitoring of fish in these areas to better understand the extent of the elevated mercury concentrations.

Fish Consumption Advisories issued October 29, 2003 due to Mercury are listed below:

- Dragon Run Swamp and Piankatank River watershed

The entire length of Dragon Run Swamp from Route 620 near the headwaters of Dragon Run downstream to a segment of the Piankatank River near the Route 606 boat landing is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals per month of largemouth bass. The original advisory issued in 2003 was updated in 2005 to cover the entire Dragon Run Swamp watershed. DEQ is conducting an assessment of the watershed looking for sources of mercury to the watershed. The affected watersheds are VAP-C02R, VAP-C02E and VAP-C03E.

- Great Dismal Swamp Canal watershed

The segment of the Great Dismal Swamp Canal from Deep Creek Lock south to the Virginia-North Carolina state line, including Lake Drummond and the feeder ditch to Lake Drummond, is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals per month of bowfin and chain pickerel. The inclusion of Lake Drummond in 2005 was an update to the previous advisory issued in 2003 for this area. The affected watershed is VAT-K39.

- Blackwater River watershed

The entire Blackwater River watershed from its headwaters near Petersburg downstream to the Virginia - North Carolina border including all its tributaries is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals per month of largemouth bass, redear sunfish, bowfin, white catfish, redhorse sucker, longnose gar and chain pickerel. The original advisory issued in 2003 affected largemouth bass and redear sunfish from the state line up to Rt. 460. The advisory was updated to include bowfin, white catfish, redhorse sucker and longnose gar and the segment was extended upstream to Rt. 31 in 2005. The latest update in 2007 expanded the segment to include the entire watershed and chain pickerel species. The affected watersheds are VAP-K31 VAP-K32 VAP-K34 VAT-K34, VAT-K33 and VAT-K36.

Fish Consumption Advisories issued September 30, 2004 due to Mercury are listed below:

- Lake Trashmore

Lake Trashmore (entire lake) in Virginia Beach is covered by an advisory. This advisory recommends eating no more than two eight-ounce meals a month of largemouth bass due to elevated levels of mercury and

carp due to elevated levels of PCBs.

- Lake Whitehurst

Lake Whitehurst (entire lake) in Norfolk is covered by an advisory. This advisory recommends that carp should not be eaten due to elevated levels of mercury and PCBs and that no more than two eight-ounce meals a month of yellow perch should be eaten due to elevated levels of PCBs.

- Lake Gordonsville

Lake Gordonsville (entire lake) in Louisa County is covered by an advisory. This advisory recommends eating no more than two eight-ounce meals a month of largemouth bass.

- Pamunkey River

The segment of the Pamunkey River from Route 615 bridge to the confluence with Jacks Creek is covered by an advisory. This advisory recommends eating no more than two eight-ounce meals a month of blue catfish.

- Mattaponi River

The segment of the Mattaponi River from Route 628 bridge downstream to Melrose Landing is covered by an advisory. This advisory recommends eating no more than two eight-ounce meals a month of largemouth bass.

- Herring Creek

The segment of the Herring Creek in King William County from Route 628 bridge to the confluence with the Mattaponi River is covered by an advisory. This advisory recommends eating no more than two eight-ounce meals a month of bluegill sunfish or yellow bullhead catfish.

Fish Consumption Advisories issued July 27, 2005 due to Mercury are listed below:

All the three fish consumption advisories listed below that were modifications to existing advisories issued in 2003 (see description under the 2003 fish consumption advisories).

- Dragon Run Swamp and Piankatank River watershed

The health advisory for the Dragon Run Swamp (entire length) from Route 620 downstream to a segment of the Piankatank River near Deep Point Boat Landing at Route 606 across from Piankatank Shores was updated. The extension from the headwaters to Deep Point Boat Landing is an update of the previous advisory for this area.

- Great Dismal Swamp Canal watershed

The health advisory for the Great Dismal Swamp Canal from the Deep Creek Locks south to the Virginia/North Carolina state line including Lake Drummond and Feeder Ditch was updated. The inclusion of Lake Drummond is an update to the previous advisory for this area.

- Blackwater River watershed

The health advisory for the Blackwater River from Rt. 31 near Dendron downstream to the Virginia/North Carolina state line was updated. The extension of the Blackwater River from Rt. 460 to Rt. 31 is an update of the previous advisory for this area.

Fish Consumption Advisories issued July 20, 2006 due to Mercury are listed below:

- Harrison Lake

Harrison Lake (entire lake) in Charles City County is covered by an advisory. This advisory recommends that no more than two eight-ounce meals of redear sunfish, largemouth bass, chain pickerel, or bowfin should be consumed per month.

- Chickahominy Lake

Chickahominy Lake (entire lake) in Charles City and New Kent counties is covered by an advisory. This advisory recommends that no more than two eight-ounce meals of largemouth bass, chain pickerel, or bowfin should be consumed per month.

Fish Consumption Advisories issued August 31, 2007 due to Mercury are listed below:

- Blackwater River watershed

The health advisory for the Blackwater River from the Virginia-North Carolina state line upstream to its headwaters near Petersburg including all its tributaries was updated (see description under the 2003 fish consumption advisories).

- Nottoway River watershed

The segment of the Nottoway River from the confluence with Blackwater River at the Virginia-North Carolina state line upstream to Route 619 near Purdy including its tributary Assamoosick Swamp is covered by an advisory. This main stem Nottoway River segment is ~92 miles. The advisory recommends that no more than two eight-ounce meals per month of largemouth bass, smallmouth bass, bowfin, redhorse sucker species, longnose gar, channel catfish, chain pickerel, or sunfish species should be consumed.

- Motts Run Reservoir

Motts Run Reservoir (entire reservoir) is covered by an advisory. This advisory recommends that no more than two eight-ounce meals per month of largemouth bass species should be consumed.

- Chandler's Mill Pond

Chandler's Mill Pond (entire pond) is covered by an advisory. This advisory recommends that no more than two eight-ounce meals per month of largemouth bass species should be consumed.

- Roanoke River watershed (Staunton River)

The segment of the Roanoke (Staunton) River from below Leesville Dam downstream to the confluence of the Dan River including its tributary Cub Creek up to Rough Creek Road (Route 695) near Rough Creek is covered by an advisory. This advisory recommends that no more than two eight-ounce meals per month of striped bass or white bass species should be consumed. There has been an existing advisory due to PCBs for various species in this segment since 1999.

- Kerr Reservoir watershed

Kerr Reservoir within the state of Virginia from the confluence of Dan River and Roanoke River to John H. Kerr Dam including its tributaries Eastland Creek and Nutbush Creek (within the state of Virginia) is covered by an advisory. This advisory recommends that no more than two eight-ounce meals per month of striped bass, white bass or largemouth bass species should be consumed. There has been an existing advisory due to PCBs for various species in this segment since 2004.

- Dan River watershed

The segment of the Dan River within the state of Virginia from the Brantley Steam Plant Dam in

Danville downstream to the confluence with Roanoke River on the John H. Kerr Reservoir, including its tributaries Hyco River up to Route 738 bridge and Banister River up to the Banister Dam, is covered by an advisory. This advisory recommends that no more than two eight-ounce meals per month of striped bass or white bass species should be consumed. There has been an existing advisory due to PCBs for various species in this segment since 1999.

- **Fish consumption advisories due to polychlorinated biphenyls (PCBs) contamination**

There are 39 health advisories that have been issued by the VDH due to contamination of fish by PCBs throughout the state. Only one of these was related to a known industrial release and the sources of the remainder of contaminated watersheds are unknown. DEQ is investigating possible and suspected sources in affected watersheds. Historically, Virginia has steadily lowered the levels of PCBs considered acceptable in fish. Prior to 1980, VDH followed guidelines developed by the FDA that considered PCB levels higher than 5,000 parts per billion (ppb) in exceedence of safety guidelines. In 1984, the FDA reduced the level to 2,000 ppb. In 1998, VDH developed its own fish consumption advisory guidelines and set its levels of concern for PCBs in fish to no more than 600 ppb. The latest guidelines announced by VDH in 2004 further reduced that level to 50 ppb. Although, the levels of PCBs have not increased, the new guidelines for determining what is acceptable for human consumption have become more protective for the public. The number of fish consumption advisories increased as a result of these more stringent guidelines. The changes in the guidelines resulted in the modification of several existing fish consumption advisories and the establishment of additional fish consumption advisories in a number of watersheds. The watersheds covered by fish consumption advisories due to PCB contamination are described below.

- South Fork Shenandoah River, North Fork Shenandoah River and Shenandoah River

In 1989, the VDH issued a public health advisory warning against the consumption of fish taken from the South Fork Shenandoah River near Front Royal because of PCBs contamination of fish in the area. The advisory extended from the Route 619 bridge downstream to the Shenandoah River headwaters. It continued from the North Fork Shenandoah River at its confluence with Passage Creek downstream to the Shenandoah River; and from the Shenandoah River from the confluence of the North and South Fork Shenandoah Rivers to the Virginia-West Virginia state border. This segment covered approximately 45 stream miles. This advisory was issued after DEQ monitoring revealed PCB levels in fish tissue samples above the 2.0 ppm FDA action level. The advisory stated that fish caught in these waters should not be consumed. The source of this contamination has been identified as Avtex Fibers Front Royal Inc. This plant closed in 1989 following revocation of their VPDES permit. The advisory was updated in 2004 and the segment on the North Fork was modified to exclude the zone above the Riverton dam. The advisory recommended no consumption of channel catfish, carp or sucker species and that no more than two eight-ounce meals a month of smallmouth bass, largemouth bass, rock bass, or sunfish species should be consumed. This health advisory is located in the watersheds: VAV-B58, VAV-B57, VAV-B55, VAV-B51 and VAV-B41.

- Main stem Roanoke River watershed (Staunton River)

In July 1998, a health advisory for fish consumption was issued for a 50-mile stretch of the Roanoke River running through Campbell, Charlotte, Halifax and Pittsylvania counties. PCBs had been detected in fish tissues of striped bass, white bass and carp at elevated levels. The advisory area extended from Seneca Creek at Route 704 near Long Island downstream to the point where a pipeline intersects Route 803 and where Route 633 in Charlotte County crosses the Roanoke River (approximately 5.4 river miles below the Rt. 360 bridge). In December 1999, the VDH expanded this fish advisory to include 29 additional miles upstream including Altavista to the Leesville Dam. In 2004, this advisory was extended to include the Roanoke River from the Leesville Dam downstream to the confluence with the Dan River. The advisory for this section of the Roanoke River recommends no consumption of carp and flathead catfish greater than 32 inches and no more than two eight-ounce meals a month of flathead catfish less than 32 inches, channel catfish, gizzard shad, golden redhorse sucker, redhorse sucker, quillback carpsucker, bluehead chub, white perch, walleye, striped bass, white bass, largemouth bass, smallmouth bass, spotted bass, rock bass or sunfish species should be consumed. The advisory has been updated in 2007 to include a portion of Cub Creek up to Rough Creek Road (State Route 695) near Rough Creek and recommends no more than two eight-ounce meals per month of blue catfish in the entire segment. A potential contributing source of the contamination has been identified

but other sources are suspected. The affected watersheds are VAW-L19, VAW-L30, VAW-L31, VAP-L36, VAP-L38, VAP-L40, VAP-L75 and VAP-L80.

- Fresh tidal embayments of the Potomac River

In April 1999, a health advisory for fish consumption was issued for a 33-mile stretch of the Potomac River from the Woodrow Wilson Bridge to Bent Point at the mouth of Aquia Creek due to contamination of fish by PCBs in the embayments of the Potomac River. The advisory states “channel catfish larger than 18 inches caught in the tidal areas in several tributaries flowing into the Potomac River near Quantico, VA may pose a potential public health risk”. The VDH issued this advisory in collaboration with Maryland, since most of this area of the Potomac River is in Maryland. The advisory was modified in 2003 and 2004 to include other fish species. In December 2004, the VDH modified the fish consumption advisory for the tidal portion of the following tributaries and embayments to the Potomac River between the I-395 bridge in Arlington downstream to the Rt. 301 bridge: Four Mile Run, Hunting Creek, Little Hunting Creek, Pohick Creek, Accotink Creek, Occoquan River, Neabsco Creek, Powell Creek, Quantico Creek, Chopawamsic Creek, Aquia Creek, and Potomac Creek. The advisory recommends no consumption of carp or channel catfish greater than 18 inches and limiting consumption to no more than two eight-ounce meals a month of channel catfish less than 18 inches, American eel, bullhead catfish, largemouth bass, anadromous striped bass, sunfish species, smallmouth bass, white catfish, white perch, gizzard shad, or yellow perch.

- Levisa Fork

In July 1999, a health advisory for fish consumption was issued for a 12-mile section of the Levisa Fork from Grundy downstream to the Virginia-Kentucky state line. This advisory recommends that no fish of any kind be eaten from that section of the Levisa Fork. The advisory was modified in 2003 and 2004. The affected watershed is VAS-Q08.

- Dan River watershed

In December 1999, a health advisory for fish consumption was issued for a 42 mile stretch of the Dan River from Kerr Reservoir at Staunton River State Park to southwestern Halifax County where the river crosses into North Carolina, north of Virginia Route 62. This fish consumption advisory was modified in December 2004 to cover the river within Virginia from the Brantley Steam Plant Dam in Danville and to include the following tributaries: the Hyco River up to the Rt. 738 bridge and the Banister River up to the Banister Dam. The advisory cautions people to not eat any flathead catfish greater than 32 inches and to eat no more than two eight-ounce meals a month of flathead catfish less than 32 inches, channel catfish, blue catfish, carp, redhorse sucker, striped bass, white bass, white perch or walleye taken from the advisory area. The affected watersheds are VAW-L60, VAP-L62, VAP-L64 and VAP-L73.

- Bluestone River

In August 2001, the VDH issued (and modified in December 2004) a health advisory for fish consumption for a section of the Bluestone River from the Rt. 460 bridge crossing south of Bluefield downstream to the Virginia-West Virginia state line near the town of Yards in Tazewell County. The advisory recommends not eating any carp and to limit consumption to no more than two eight-ounce meals a month of white sucker, rock bass or largemouth bass from this section of the Bluestone River. The affected watersheds are VAS-N36 and VAS-N37.

- New River

In August 2001, the VDH issued (and modified in December 2004) a health advisory for fish consumption for a section of the New River from the Claytor Lake Dam downstream to the Virginia/West Virginia state line near the town of Glen Lyn. The advisory recommends not eating any carp and limiting consumption of flathead or channel catfish to no more than two eight-ounce meals a month.

- Tidal Lower James River watershed

In July 2002, the VDH issued a health advisory for fish consumption for a section of the James River from the Interstate 95 bridge in Richmond downstream to the Hampton Roads bridge and the tidal portions of the following tributaries: Appomattox River up to the Lake Chesdin Dam, Bailey Creek up to Rt. 630, Bailey Bay, Chickahominy River up to Walkers Dam, Skiffes Creek up to the Skiffes Creek Dam, Pagan River and Jones Creek, Chuckatuck Creek, Nansemond River, Bennett Creek, Star Creek, Hampton River, Willoughby Bay and the Elizabeth River system (Western Branch, Eastern Branch, Southern Branch and the Lafayette River), and tidal tributaries St. Julian Creek, Deep Creek and Broad Creek. The advisory was modified in 2004 and recommends not eating any gizzard shad, carp or blue catfish greater than 32 inches and limiting consumption to no more than two eight-ounce meals a month of blue catfish less than 32 inches, channel catfish, white catfish, largemouth bass, white perch, bluegill sunfish, American eel, flathead catfish, quillback carpsucker, smallmouth bass, creek chub, yellow bullhead catfish, anadromous striped bass, bluefish, croaker and spot. In 2006, the existing advisory was updated to include additional species, with a consumption recommendation of no more than two eight-ounce meals per month of hickory shad, blueback herring and flathead catfish less than 32 inches. Additionally, flathead catfish greater than or equal to 32 inches should not be eaten. Poythress Run, a small tributary in Hopewell, was added to the advisory for the lower James River. DEQ is conducting additional investigations in this area to better determine the extent of the concern and to try to find the source of the contamination. The affected watersheds are VAP-G01E through VAP-G04E, VAP-G08E, VAP-J15E, VAT-G10E, VAT-G11E, VAT-G13E and VAT-G15E.

- Smith Mountain Lake watershed (Roanoke River)

In October 2003, the VDH issued a fish consumption advisory for a section of the Roanoke River from the Niagara Dam downstream to a point in the Smith Mountain Lake, approximately 2.5 miles downstream of the Rt. 634 bridge. DEQ fish tissue monitoring data from 2002 showed that flathead catfish collected from the Roanoke River near Hardy contained total PCBs at levels that exceeded the VDH's level of concern. This advisory zone was modified in 2004 and expanded to the Smith Mountain Lake Dam including the Blackwater River arm up to the Rt. 122 bridge. This fish consumption advisory recommends not eating any flathead catfish greater than 32 inches and eating no more than one eight-ounce meal per month of flathead catfish less than 32 inches, striped bass, largemouth bass, carp, redhorse sucker, or gizzard shad from this advisory area. The advisory was updated in 2005 and recommended that no more than two eight-ounce meals per month of channel catfish should be consumed in this segment. The affected watersheds are VAW-L07 and VAW-L12.

- Knox Creek watershed

In May 2003, the VDH issued (and modified in June 2004 and updated in December 2004) a health advisory for fish consumption for a section of Knox Creek from the Virginia-Kentucky state line upstream to its headwaters. The advisory recommends not eating any smallmouth bass, rock bass, channel catfish, creek chub, golden redhorse sucker, northern hogsucker or redhorse sucker and eating no more than two eight-ounce meals per month of any other fish species taken from the advisory area. DEQ intends to conduct additional investigations in this area to better determine the extent of the concern and to try to find the source of the contamination. The affected watershed is VAS-Q03.

- Beaver Creek watershed

In May 2003, the VDH issued (and modified December 2004) a health advisory for fish consumption for a section of Beaver Creek from the Beaver Creek Lake Dam downstream to the Virginia-Tennessee state line in Bristol. The advisory recommends not eating any carp, largemouth bass or smallmouth bass and eating no more than one eight-ounce meal per month of any other fish taken from the advisory area. DEQ intends to conduct additional investigations in this area to better determine the extent of the concern and to try to find the source of the contamination. The affected watershed is VAS-O07.

- Lake Anna watershed (York River)

In June 2004, the VDH issued a fish consumption advisory for Lake Anna including its tributaries Terry's Run, Goldmine Creek and Contrary Creek. The advisory was modified in December 2004 to recommend eating no more than two eight-ounce meals a month of carp, largemouth bass, striped bass, white

catfish, channel catfish or bluegill sunfish caught in the watershed. This advisory was updated in 2007 to further recommend not eating any gizzard shad and no more than two eight-ounce meals a month of white perch.

Fish Consumption Advisories issued in December 13, 2004 due to new PCBs guidelines are listed below:

In December 2004, following the lowering of the amount of PCBs necessary to trigger a fish consumption advisory, a number of new health advisories were issued throughout the state. The advisories that were issued are described below.

- Lewis Creek

The segment of Lewis Creek from Rt. 252 south of Staunton downstream to the confluence of the Middle River is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of bluehead chub or white sucker.

- Upper Potomac River watershed

The following tributaries to the Potomac River between the Virginia-Maryland state line near Rt. 340 downstream to the I-395 bridge in Arlington, Goose Creek up to the Dulles Greenway Road bridge, Broad Run up to Rt. 625, Difficult Run up to Rt. 7, and Pimmit Run up to Rt. 309 are covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of American eel from these waters.

- Tidal tributaries of the Lower Potomac River

The tidal portion of the following tributaries to the Potomac River between the Rt. 301 bridge downstream to the mouth of the river near Smith Point: Upper Machodoc Creek, Monroe Creek and Coan River are covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of gizzard shad, white perch or channel catfish from these waters.

- Bull Run

Bull Run in Fairfax County, Manassas Park City and Prince William County near Manassas Park from the I-66 bridge downstream to the Route 612 (Yates Ford Road) bridge is covered by an advisory. The previous advisory issued in 2004 recommended that no more than two eight-ounce meals per month of channel catfish should be consumed. The advisory was updated in 2005 to also recommend that no more than two eight-ounce meals per month of carp should be consumed.

- Rappahannock River watershed

The segment of the Rappahannock River from the I-95 bridge downstream to the mouth of the river including the tributaries Hazel Run up to the I-95 bridge and Claiborne Run up to the Rt. 1 bridge is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of American eel, blue catfish, carp, channel catfish, croaker, gizzard shad or striped bass caught in these waters.

- Mountain Run

The segment of Mountain Run from Rt. 15/29 bridge near Culpepper to the confluence with the Rappahannock River is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of American eel.

- York River watershed

The segment of the York River from West Point down to the mouth as well as the tidal portion of the following tributaries: King Creek, Queen Creek and Wormley Creek are covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of croaker, spot or gizzard shad caught in

these waters.

- Mattaponi River

The segment of the Mattaponi River from the confluence with Herring Creek downstream to the confluence with Aylett Creek is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of anadromous striped bass, white perch or gizzard shad caught in this segment of the watershed.

- Maury River

The segment of the Maury River from Buena Vista at Rt. 60 to the confluence with the James River is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of redbreast sunfish, rock bass or yellow bullhead catfish caught in this section of the river. The advisory was updated in 2006 and also recommend that no more than two eight-ounce meals a month of carp should be eaten from this segment.

- Middle James River watershed

The segment of the James River from Big Island Dam (below the Blue Ridge Parkway) downstream to the I-95 bridge in Richmond including its tributaries: Hardware River up to the Rt. 6 bridge and Slate River up to Route 676 is covered by an advisory. The advisory recommends limiting consumption to no more than two eight-ounce meals a month of gizzard shad, carp, American eel, quillback carpsucker or flathead catfish caught in this section of the river.

- Chesapeake Bay and Small Coastal Bays Basin

The Chesapeake Bay and its small coastal tributaries are covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of anadromous striped bass caught in these waters.

- Lake Trashmore

Lake Trashmore (entire lake) in Virginia Beach is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of carp.

- Lake Whitehurst

Lake Whitehurst (entire lake) in Norfolk is covered by an advisory. This advisory recommends that carp should not be eaten due to elevated levels of PCBs and mercury and that no more than two eight-ounce meals a month of yellow perch should be eaten due to elevated levels of PCBs.

- Eastern Branch Lynnhaven River

Eastern Branch of Lynnhaven River in Virginia Beach is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of gizzard shad.

- Little Creek

Little Creek in Norfolk near the Naval Reservation Little Creek Amphibious Base is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of gizzard shad, spot or croaker.

- Tabb Creek

Tabb Creek near Langley Air Force Base in Poquoson City is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of croaker or gizzard shad.

- Mobjack Bay

Mobjack Bay and its tributaries East River, North River and Ware River in Mathews and Gloucester Counties are covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of gizzard shad.

- Meherrin River

The segment of the Meherrin River from Emporia Dam downstream to Route 730 bridge crossing is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of gizzard shad.

- Upper Roanoke River watershed

The upper portion of the Roanoke River from the confluence of the South and North Forks of the Roanoke River at Lafayette downstream to the Niagara Dam including its tributaries Peters Creek up to the Rt. 460 bridge and Tinker Creek up to the confluence with Deer Branch Creek near Rt. 115 is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of carp, redhorse sucker, bluehead chub, largemouth bass, smallmouth bass, rock bass or redbreast sunfish.

- Kerr Reservoir watershed (Roanoke River)

Kerr Reservoir within the state of Virginia from the confluence of the Dan River and Roanoke River to the John H. Kerr Dam including its tributaries Eastland Creek and Nutbush Creek is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of carp, redhorse sucker, largemouth bass, smallmouth bass, white bass, striped bass, white perch, walleye, channel catfish or flathead catfish.

- New River

The segment of the New River from Rt. 77 downstream to the Claytor Lake Dam including Peak Creek up to the confluence with North Fork Peak Creek (Track Fork) and Reed Creek up to the confluence with Miller Creek near Rt. 121 is covered by an advisory. The advisory recommends not eating more than two eight-ounce meals a month of carp or smallmouth bass.

- Upper Levisa Fork watershed

The segment of the upper Levisa Fork from the confluence of Slate Creek upstream to the confluence with Contrary Creek including the tributary Garden Creek up to the confluence of the Right Fork of Garden Creek is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of all fish species in the watershed.

- Guest River watershed

The segment of Guest River from Rt. 23 near Esserville downstream to the confluence with the Clinch River, including the tributary Bear Creek up to the confluence with Yellow Creek is covered by an advisory. The advisory recommends eating no more than two eight-ounce meals a month of carp, river chub or stoneroller from the watershed.

- Stock Creek

The segment of Stock Creek from Route 650 bridge above Natural Tunnel downstream to the confluence with Clinch River near Clinchport is covered by an advisory. The advisory recommends not eating more than two eight-ounce meals a month of brown trout, rainbow trout, or white sucker caught in this segment of the watershed.

- Wolf Creek

The segment of Wolf Creek from Route 670 near Abington downstream to Rt. 75 near Green Spring is covered by an advisory. The advisory recommends not eating more than two eight-ounce meals a month of carp or northern hogsucker caught in this segment of the watershed

- North Fork Holston River

A segment of the North Fork Holston River between Rt. 91 near Saltville downstream to Rt. 80 is covered by an advisory. PCBs were detected in fish above the guidelines recommended by the VDH for safe consumption at no more than two eight-ounce meals a month. However, this segment of the river has an existing ban or prohibition on taking any fish for consumption in the North Fork Holston River due to mercury contamination. Only catch and release of these fish is permissible.

Fish Consumption Advisories issued in July 27, 2005 due to PCBs are listed below:

- Indian Run

Indian Run (entire Run) in Fairfax County near Annandale downstream from State Route 236 approximately three miles to Back Lick Run is covered by an advisory. The advisory recommends that no more than two eight-ounce meals per month of creek chub should be consumed.

- Bull Run

The health advisory for Bull Run in Fairfax County, Manassas Park City and Prince William County near Manassas Park from the I-66 bridge downstream to the Route 612 (Yates Ford Road) bridge has been updated. The previous advisory recommended that no more than two eight-ounce meals per month of channel catfish should be consumed. The advisory was updated in 2005 to also recommend that no more than two eight-ounce meals per month of carp should be consumed.

- Smith Mountain Lake watershed (Roanoke River)

The health advisory for Roanoke River/Smith Mountain Lake in Roanoke County, Franklin County, Bedford County and Pittsylvania County from below the Niagara Dam downstream to Smith Mountain Dam, including the Blackwater River to the Rt. 122 bridge has been updated. The advisory has been updated to also recommend that no more than two eight-ounce meals per month of channel catfish should be consumed.

- Beaver Creek watershed

The health advisory for Beaver Creek in Washington County and Bristol City from Beaver Creek Dam downstream to the Virginia-Tennessee state line within the City of Bristol has been updated. The affected segment was expanded to include, Little Creek, a tributary and modified to also recommend that smallmouth bass not be eaten and no more than two eight-ounce meals per month of any other species should be consumed.

- Knox Creek watershed

The health advisory for Knox Creek in Buchanan County from the Virginia-Kentucky state line upstream to its headwaters near the Virginia-West Virginia state line including its tributaries has been updated. The advisory was modified to also recommend that channel catfish, redhorse sucker and creek chub not be consumed.

Fish Consumption Advisories issued in October 10, 2006 due to PCBs are listed below:

- Maury River

The health advisory for the segment of the Maury River from Buena Vista at Rt. 60 to where it meets the James River has been updated. VDH recommends that no more than two eight-ounce meals per month of carp should be consumed.

- Tidal Lower James River watershed

The health advisory for the segment of the James River from the I-95 James River bridge in Richmond downstream to the Hampton Roads Bridge Tunnel has been updated. VDH included additional species with a consumption recommendation of no more than two eight-ounce meals per month of hickory shad, blueback herring and flathead catfish less than 32 inches. Additionally, flathead catfish greater than or equal to 32 inches should not be eaten. Poythress Run, a small tributary in Hopewell, was added to the advisory for the lower James River.

Fish Consumption Advisories issued in August 31, 2007 due to PCBs are listed below:

- Main stem Roanoke River watershed (Staunton River)

The health advisory for the segment of the Roanoke (Staunton) River from below Leesville Dam downstream to the confluence of the Dan River has been updated to include its tributary Cub Creek up to Rough Creek Road (Route 695) near Rough Creek.

- Lake Anna watershed (York River)

The health advisory for Lake Anna including its tributaries Terry's Run, Goldmine Creek and Contrary Creek has been updated to further recommend not eating any gizzard shad and no more than two eight-ounce meals a month of white perch.

**Shellfish Condemnations**

The VDH has prohibited and/or condemned harvest of approximately 80 square miles of productive shellfish areas in the waters of Virginia. Another 3 square miles have been seasonally condemned, which restricts direct harvesting from 1 April to 31 October of each year. These areas are all located in the Chesapeake Bay and tidewater areas of the state, and include waters surrounding certain point source discharges, as well as areas with elevated fecal coliform bacteria concentrations or other health-related pollutants. Shellfish may be harvested from most restricted areas; however, they must first be relayed to "approved" waters for depuration for 15 days before marketing. Relaying is only allowed when the water temperature is above 50°F. The taking of shellfish is prohibited in three bodies of water: the Elizabeth and Lafayette Rivers, both sub basins within the lower James River; and Little Creek in the Small Coastal and Chesapeake Bay Basin.

**Fish Tissue Contamination**

- Routine and Special Study Fish Tissue Data.

This section summarizes the fish tissue contaminant data collected, analyzed and/or evaluated during the period covered in this report. The data were collected via DEQ's routine five-year rotational monitoring of fish and sediment samples for contaminant analysis in the state river basins (see Chapter 2.1 for details about this program), as well as from follow-up and special monitoring studies conducted once the routine program identified potential problem areas. The data reviewed for this report covers data collected from 2000 through 2006. Fish tissue contaminants data for routine monitoring are posted on the DEQ web site at <http://www.deq.virginia.gov/fishtissue/>. All of these data have been reviewed by the VDH.

- Virginia Water Quality Standard based Fish Tissue Value or Screening Value Exceedences.

The monitoring station data list found on the DEQ website at <http://www.deq.virginia.gov/fishtissue> includes the approximately 460 stations that DEQ sampled in its routine rotational river basin monitoring program (including follow-up monitoring) between 1995 and 2006. It also tabulates the number of

exceedences of human health screening values for those routine monitoring stations where there were exceedences for one or more contaminants in edible fish fillets or shellfish. Contaminant screening values are computed using EPA risk assessment techniques for non-carcinogenic and carcinogenic effects and are based on the same fish tissue concentrations that are the basis for the numerical water quality criteria that are designed to prevent fish contamination. These stations were not randomly selected. Instead, many of the stations were targeted for sampling because of potential or known water pollution problems identified via a search of historical data and reports.

- Selection Basis for Stations Discussed.

This report summary highlights those stations where current contaminant levels alone or in combination with other data and studies were:

- a) at a Virginia Department of Health ("VDH") level of concern for human health requiring a fish consumption advisory or advisory extension (see page 6.5-2), or
- b) at a VDH or DEQ level of concern requiring special follow-up studies (most are listed at <http://www.deq.virginia.gov/water/reports.html>), or
- c) below levels of concern where VDH determined the existing fish consumption advisory could be lifted due to a decline in levels of contamination. A complete list of fish advisories in Virginia can be found at <http://www.vdh.state.va.us/epidemiology/publichealthtoxicology/Advisories/index.htm>

During this period DEQ and the VDH were also able to complete risk evaluations at several sites reported for ongoing or future evaluation in previous editions of this report. These decisions are included in this report in order to finalize the information on previously reported potential human health concerns. This report does not highlight station exceedences where VDH determined, at the time of data review, that no further action was needed unless these stations were monitored as a follow-up to a VDH request for additional sampling.

### **Lead**

- No Current EPA Screening Value for Lead in fish tissue.

The specific toxicological information needed to calculate a screening value is not available for lead at this time and EPA does not have a screening value for lead in fish tissue. Therefore, DEQ cannot use a screening value to assess the data for lead found in fish tissue. To address this issue, DEQ reports any concentration of lead detected by our contract analytical lab to the VDH for its review and recommendations. To address this unusual situation in this report, all instances of lead detected at any concentration in fish tissue are noted in the monitoring station data list found on the DEQ website.

- 1993 - 1994 Lead Data Suspect Due to Laboratory Problems.

Previous 305(b) reports noted that lead had been detected in at least some of the fish samples at each station sampled in 1994 as well as in 1993, and additional follow-up work was planned. Upon further investigation, DEQ identified detection limit problems at the contract laboratory. This made all of the lead concentrations for the 1993 - 1994 fish tissue samples suspect. Therefore, these lead concentrations were not used in the assessment of the 1993-1994 data and were not included in the monitoring station list associated with previous reports as exceedences. Furthermore, VDH did not consider the concentrations for the suspect lead data to be at levels of concern. In 1995 DEQ switched to another contract lab capable of detecting metals and organics at lower detection limits. Lead was detected in less than 4 percent of fish analyzed between 1995 and 1998. When DEQ re-sampled one of the 1994 stations with suspect lead levels (Mattaponi River) in 1996, lead was reported below detection limits (<0.1 ppm).

- VDH Requests for Follow-up Sampling.

In subsequent monitoring years (1995 – 1998), lead was detected at 15 river basin stations. Of these

15 stations, VDH asked DEQ to follow-up with additional sampling at two sites sampled in 1997 (Kiptopeke State Park and Bagwell Creek). These two stations were re-sampled in 2000 and lead was not detected in any fish samples from Bagwell Creek. Lead was detected at the detection level of 0.1 ppm in only one of six fish samples (gray trout) at Kiptopeke State Park. These data were reported to the VDH and they did not recommend any further action.

### **Arsenic**

There are some uncertainties associated with assessing potential health risks posed by arsenic in fish tissue. Arsenic does not have a high potential for bioaccumulation and is not a common contaminant in most fish samples. It is more likely to be detected in marine and estuarine species and is seldomly detected in freshwater species. On the other hand, arsenic has recently been classified as a human carcinogen, making this an important potential contaminant in fish tissue. However, the carcinogenic potential of arsenic is associated with the inorganic forms of arsenic while organic forms of arsenic are not thought to be carcinogenic. DEQ has developed a fish tissue screening value for arsenic in fish tissue of 72 µg/kg based on its carcinogenic potential and DEQ intends this screening value to be applied to the inorganic form of arsenic. Unfortunately, all data available to DEQ for arsenic in fish tissue are total arsenic concentrations, which include both organic and inorganic forms. This makes assessing the potential for increased cancer risk due to total arsenic in fish tissue problematic. For the 305(b) assessment purposes, DEQ uses a conservative approach and assesses the fish tissue screening value for inorganic arsenic using the available total arsenic concentrations. This approach essentially assumes all total arsenic in fish tissue may be in the inorganic form. DEQ uses this approach in order to be protective and avoid underestimating potential human health risks but also recognizes that this is a conservative method. Some studies (primarily involving marine and estuarine species) show that estimates for the portion of inorganic arsenic in fish tissue is variable but may be only approximately 10% of the total arsenic concentration.

In the 305(b) assessment process, all fish samples that exceed 72 µg/kg total arsenic will be assessed as fully supporting with observed effects, but will not result in an impaired assessment. The purpose of this conservative assessment is to identify areas with elevated levels of arsenic in fish tissue to help DEQ determine where additional investigation may be warranted. Additionally, all fish samples that exceed 72 µg/kg total arsenic are identified and reported to the VDH for their evaluation. EPA has recently developed a method for analyzing the speciation of arsenic in fish tissue which can differentiate inorganic forms of arsenic. However, this new method is complicated and is far more costly than total arsenic analysis. This new method may be useful in the future in identifying the inorganic arsenic concentrations in fish at sites where additional, more detailed investigations may be considered necessary.

### **Polychlorinated Biphenyls (PCBs)**

- Shenandoah River and South and North Forks of the Shenandoah River Fish Consumption Advisory.

VDH reviewed the fish PCB data collected in 1996 and 1999 from stations on the Shenandoah River and South and North Forks of the Shenandoah River that contained PCBs above the VDH level of concern. Because these fish were from areas currently subject to a fish consumption advisory established in 1989, VDH determined that no further action was needed. The advisory has since been modified.

- Roanoke (Staunton) River Fish Consumption Advisory.

Data collected by DEQ in 1993 during a special Roanoke (Staunton) River basin study led VDH to issue a fish consumption advisory in 1998. The area covered by the advisory was expanded in 1999 in response to additional DEQ sampling results above the VDH level of concern of 600 parts per billion. (See page 2.5-3 of this report and the DEQ web site for additional information). DEQ is now focusing on identification of potential point sources for the contamination.

- Dan River Fish Consumption Advisory.

Data collected by DEQ in 1999 from the Dan River showed elevated levels of PCBs in some species of fish from various areas of the river. On December 27, 1999 the VDH issued a fish consumption advisory for

the Dan River from the Virginia-North Carolina border (north of the VA Rt. 62) downstream to the Kerr Reservoir at the Staunton River State Park. The fish consumption advisory recommends that no more than two eight-ounce meals a month of flathead catfish or channel catfish be consumed. The advisory has since been modified.

- Levisa Fork Fish Consumption Advisory.

In 1997, DEQ included a station on the Levisa Fork at the state line in its routine river basin rotational sampling because PCBs had previously been detected in fish at this location. Three out of four of the fish species samples collected at Levisa Fork in 1997 exceeded the 600 parts per billion level of concern for PCBs established by VDH for issuing fish consumption advisories. The VDH issued a fish-eating advisory for a 12-mile stretch of Levisa Fork in 1999 (See page 6.5-3). In response to a request from VDH, DEQ conducted a special fish and sediment study in Levisa Fork in 2000 in an attempt to bracket the extent of fish contamination. The VDH reviewed these new data and determined that the only fish that exceeded their level of concern were from areas currently subject to a fish consumption advisory. Therefore, VDH determined that no further action was needed at that time. Results of the 2002 DEQ fish tissue monitoring prompted the VDH to modify the existing fish consumption advisory to apply to all fish in this section of the river.

- Deep Creek Follow-up Sampling.

VDH asked DEQ to resample Deep Creek (Southern Branch of the Elizabeth River) in 2000 because a gizzard shad sample collected at that station in 1998 exceeded the screening value for PCBs. DEQ had also conducted a special study in the Elizabeth River in 1993 and these stations are listed in Appendix B. PCB levels in all species collected at the Deep Creek station in 2000 except gizzard shad were below the VDH 600 ppb level of concern. VDH has reviewed the recent monitoring data and since gizzard shad is not the type of fish that people commonly eat, determined that no further action is warranted at this time. Additional DEQ sampling in the Elizabeth River system was conducted in 2001. Analytical data from these 2001 fish samples were received by DEQ from the laboratory in the summer of 2002. Following the review and evaluation of these 2001 fish contaminant data, VDH included Deep Creek as part of the Lower James River PCBs advisory zone.

- Four Mile Run Special Study.

Samples were collected in Four Mile Run during October 1997 in response to concerns about run-off problems from the nearby Potomac Yard in Northern Virginia. The local Health Department made the request for the special study via the DEQ Northern Regional Office in response to citizen concerns. VDH reviewed the data results and determined that the level of contaminants (PCBs, total chlordane and total PAHs) posed no significant risks to human health. In 2004, VDH issued a fish consumption advisory due to PCBs for this watershed.

- James River 1997 Fish Study of PCB Levels.

The US Fish and Wildlife Service had expressed concern due to the presence of PCBs in fish tissue from the James River (River Miles 76.0-69.0) and the DEQ's "low" priority designation during its review of DEQ's final 303(d) TMDL (Total Maximum Daily Load) Priority List for 1996. The Service also expressed concern that the area was a roosting habitat for the bald eagle and limited fish tissue data were available for the river segment. In addition, DEQ-Piedmont Regional Office ("PRO") staff identified high concentrations of polychlorinated terphenyls (PCTs) in sediment in Bailey Creek. So in 1997, 45 fish tissue samples were collected from seven stations in the James River and its tributaries in the vicinity of Hopewell. The study was a joint effort between DEQ-PRO and Central Office staff, and involved fish tissue and sediment collections. These samples were analyzed for PCBs, PCTs, and chlorinated pesticides. Thirty-five of the 45 fish tissue samples had PCB levels in excess of the DEQ screening value; however, only one sample had a PCB concentration above the VDH advisory level. Fish tissue data were transmitted to PRO staff during November 1998. During early December 1998 PRO staff made a data report presentation to other DEQ staff and VDH personnel. An old landfill in Hopewell was identified as the source of PCBs and PCTs to the James River system. At PRO's request, USEPA Superfund monitoring staff sampled the landfill area and creek running through it in January 1999 and determined that the site contamination was not sufficient to warrant Superfund

cleanup. EPA found PCTs upstream of the landfill and suggested that old industrial sources might be contributing to the contamination. At the request of the industry, PRO sampled stormwater outfalls at the headwaters of the creek for PCTs and PCBs in May 1999. PRO found PCTs in the 1 to 5 ppm ranges and PCBs in the 0.2 to 1.6 ppm range in sediments. These results were below the clean-up requirements of EPA Superfund, and the case was considered resolved pending further information. VDH asked DEQ to resample Bailey Bay in 2001 or 2002. DEQ re-sampled Bailey Bay in 2001. Analytical data from these 2001 fish samples were received by DEQ from the lab in the summer of 2002. DEQ and the VDH reviewed the 2001 fish-contaminant data to determine the need for appropriate follow-up action. After reviewing the data, the VDH issued a fish consumption advisory in July 2002. This fish consumption advisory is described above in the section on fish consumption advisories and restrictions. DEQ re-sampled additional fish from this section of the James in 2003 and 2005 to investigate this matter further.

- Revisit Potomac River Fish Consumption Advisory Area.

The fish consumption advisory for the Potomac River is described on page 6.5-3. At the request of VDH, DEQ re-sampled the Potomac River and Virginia tributaries in 2000. Some carp and channel catfish samples from the Potomac embayment stations had PCBs higher than the VDH level of concern of 600 ppb for PCBs. However, all these stations are within sections of the river where a fish consumption advisory is already in effect. Therefore, based on the year 2000 monitoring data, the VDH has determined that no further action is warranted at this time. The advisory has since been modified.

- Mountain Run and Bull Run.

During this period, the DEQ completed follow-up monitoring of fish and sediment from Mountain Run and Bull Run. Latest sampling results in 1999 found PCBs and PAHs in the fish but not at the VDH levels of concern. In 2004, VDH issued fish consumption advisory due to PCBs for both bodies of water.

- New River Fish Consumption Advisory Area.

Based on data from fish collected by DEQ in 2000, on August 6, 2001 VDH issued a fish advisory for the New River from the Rt. 114 bridge north of Radford to the Virginia-West Virginia state line. This new fish consumption advisory applies only to carp and recommends that no carp be consumed from the affected portion of the river. Based on DEQ data collected in 2000 and discussions with VDH, DEQ collected additional samples from the New River in October 2001 at the following locations; downstream of Claytor Lake dam, downstream of Radford, near Whitethorne, near Pembroke and at Glen Lyn. Additional sampling to gain additional data in this section of the New River was performed for 2002. The VDH reviewed these data and determined that no adjustments were required to the fish consumption advisory issued in August 2001. The advisory has since been modified.

- Bluestone River Fish Consumption Advisory Area.

Based on data from fish collected by DEQ in 2000, on August 6, 2001 VDH issued a fish advisory for the Bluestone River from the Rt. 460-bridge crossing south of Bluefield to the Virginia-West Virginia state line. This new fish consumption advisory applies only to carp and recommends that no carp be consumed from the affected portion of the river. Based on our data collected in 2000 and discussions with VDH, DEQ re-sampled this area on the Bluestone River near the sewer plant road near Route 717 and near the town of Yards in 2002. The VDH reviewed these data and determined no adjustments were required to the fish consumption advisory issued in August 2001. The advisory has since been modified.

## **Mercury**

- North Fork Holston Mercury Monitoring.

A station on the North Fork of the Holston River exceeded the screening value for mercury in 1997. This area was already under a long-term fish consumption advisory prohibiting the taking of fish from these waters for human consumption due to historical mercury contamination from a Superfund site, described on page 6.5-2. DEQ fish tissue monitoring data from 1997 and 2002 showed no fish samples contained mercury

at concentrations greater than the FDA action level for mercury (1.0 ppm) or the WQS TV for mercury (1.1 ppm). However, some samples of rock bass were above the Virginia Department of Health's level of concern for mercury of 0.5 ppm. Subsequent monitoring data in 2003 and 2005 indicated elevated mercury levels above the FDA and WQS TV in several species.

- Shenandoah River Mercury Monitoring.

DEQ's Valley Regional Office has an ongoing monitoring program for mercury in fish tissue, water and sediment in the South River and South Fork Shenandoah River. There have been restrictions or health advisories on consumption of fish from portions of the South and South Fork Shenandoah Rivers since the 1970s (see page 6.5-2). A fish consumption advisory in some form has been in place for some portions of this river system since the 1980s. The mercury contamination originated from historic practices at the E.I. DuPont Plant in Waynesboro. In a settlement between DuPont and the Commonwealth in the early 1980s, a trust fund was established to support monitoring in the river for a projected 100-year period. Fish were most recently sampled in 1996, 1999, 2001, 2003 and 2005. The results are available on the DEQ web site at <http://www.deq.virginia.gov/fishtissue/mercury.html>. The VDH has evaluated all these data as well as recent recommendations from the National Academy of Sciences regarding mercury toxicity and assumptions of fish consumption rates. Based on their review, the VDH has changed their guidelines for issuing fish consumption advisories for mercury and has lowered their level of concern from 1.0 ppm to 0.50 ppm mercury. This is based on a new assumption of two eight-ounce meals a month, while the old screening value was based on approximately one meal per month. Based on the new, lower level of concern for mercury the VDH determined that the existing fish consumption advisory should remain in effect and be expanded into some additional portions of the river system. The revised advisory also contains updated recommendations on the amounts of fish that can safely be consumed in different sections of the rivers. The VDH stated that this action was not due to changes in mercury levels in the fish but was due to the VDH "lowering the amount of mercury recommended for fish consumption to provide more protection to the public". More information can be found at <http://www.vdh.state.va.us/epidemiology/publichealthtoxicology/publications.htm>. DEQ continues to monitor mercury contamination in this river system through regular meetings with stakeholders, review of literature, and communications with other experts in the field. Additional fish tissue monitoring for mercury contamination in this river system is on going as part of the 100-year monitoring plan.

- Dragon Swamp Mercury Monitoring.

Based on mercury levels detected in fish collected during the routine rotational river basin sampling in 1998, VDH requested that DEQ resample the site in 2000. One of seven species tested at this site in 2000 exceeded the VDH screening value of 0.50 ppm. This 2000 datum was for a largemouth bass at 0.59 ppm; in 1998 the largemouth bass sample was analyzed at 1.9 ppm. DEQ sampled the site again in 2002. As a result of the 2002 DEQ sampling the VDH issued a fish consumption advisory for largemouth bass for a section of the Dragon Swamp in 2003. This is discussed above in the section on fish consumption advisories and below under "mercury in swamp waters".

- Tennessee/Big Sandy River Basin Mercury Monitoring.

The VDH had concerns about mercury concentrations in whole fish from two stations (Cranesnest River and J. W. Flannagan Reservoir) sampled during the DEQ 1991 coalfields study. However, VDH could not draw any significant conclusions on associated health risks from the whole fish data. DEQ re-sampled these two stations in 1997 for mercury analysis of edible fillets. VDH has reviewed the data from 1997 and determined that the reported levels were not at a level of concern and that no additional sampling from these sites was necessary.

### **Mercury in Swamp Waters**

In recent years there has been increasing interest in mercury contamination in fish tissue. A number of studies around the country, from the Everglades through the swamps of the southeastern United States as well as in lakes, bogs and wetlands in New England, Wisconsin and Minnesota have shown that top level predator fish species analyzed in these habitats frequently contain elevated levels of mercury. A number of these studies show that there are no known local sources of mercury in these areas and suggest that

deposition of air-borne mercury is a suspected source of the mercury. These water bodies share natural, physical characteristics of low pH, high organic content and still or slow moving current which promote the natural methylation of mercury into the highly bioaccumulative compound methylmercury. Increased natural production of methylmercury increases the possibility that the mercury content of fish will be elevated, especially in upper level predators. This emerging realization that some water bodies may be naturally more prone to elevated levels of bioaccumulative mercury, along with the new, lower fish mercury concentration that is now being used by the VDH as an acceptable level of mercury in fish tissue has prompted DEQ to investigate potential mercury contamination more closely.

DEQ has traditionally focused the fish tissue monitoring program to monitor sites with suspected sources of pollution and apparently unpolluted habitats such as swamps were given low priority for monitoring.

In order to investigate the new concern for this swamp water and mercury methylation issue, DEQ has begun to sample these habitats in more areas where there are no known or suspected sources of mercury but where the environmental conditions are favorable for mercury methylation. As a result of this sampling in 2002, elevated levels of mercury were discovered in top-level predator fish species in three swamps or “blackwater” rivers.

In October 2003, VDH established fish consumption advisories due to elevated mercury levels detected in fish-tissue in top-level predator fish species for three swamps or “blackwater” rivers. These fish consumption advisories are for the Dragon Swamp /Piankatank River, the Great Dismal Swamp Canal and the Blackwater River. These fish consumption advisories are described in more detail in the section on fish consumption advisories.

Similar elevated levels of mercury in fish-eating species of fish have been noted in similar habitats in the southeastern United States as well as lakes, bogs and wetlands in New England, Wisconsin and Minnesota. In many of these areas there are no known sources of mercury. Deposition of airborne mercury has been identified as a possible source of the mercury to the swamp water, where methylation takes place resulting in bioaccumulation up the food chain, resulting in elevated levels of mercury in the fish eating fish. This is also considered a possibility in these swamp waters in Virginia. DEQ is investigating this possibility as well as other potential sources of mercury to these water bodies. DEQ has initiated additional monitoring of fish in these areas to better understand the extent of the elevated mercury concentrations.

### **DDT/DDE**

- Two Lakes at Tidewater Community College.

The DEQ Waste Division requested VDH review of DDT/DDE concentrations in whole fish collected from two Tidewater Community College lakes at a Superfund site. The VDH preferred edible fillets but found that even the concentrations in the whole fish were below levels of concern. At the request of citizens, DEQ collected fish from the two lakes for analysis of edible fish fillets in 2000 and the VDH has reviewed these data and determined that the low concentrations in the fish present no health risks.

### **Dioxin**

- Blackwater and Nottoway Rivers.

Due to dioxin contamination by the Union Camp Company in Franklin, Virginia, a fish eating advisory was issued by the VDH in 1990 for portions of the Blackwater and Nottoway Rivers. Union Camp subsequently changed its process operations. At the request of the VDH, DEQ sampled one station each in the Blackwater and Nottoway Rivers in late 1997 for dioxin levels in fish. The results verified similar findings by Union Camp Company that the dioxin levels in the fish were below the VDH level of concern, and the advisory was lifted by VDH on March 26, 1998.

### **Kepone**

- James and Chickahominy Rivers.

From 1975 until 2000, DEQ, in consultation with the VDH, annually collected fish for kepone analysis from the James River downstream of Hopewell and the in the vicinity of the mouth of the Chickahominy River and in the Hampton Roads area. Nine of the 253 fish samples collected and analyzed in 1994 exceeded the FDA action level of 0.3 ppm. In 1995 one sample out of 260 exceeded the 0.3 ppm action level. Since 1995, none of the edible fillet samples from the annual collections has exceeded the FDA action level. A biennium sampling schedule was followed until 2004, which was then changed to a five-year schedule with the next sampling to be conducted in 2009.

### **Tributyltin**

Surface water samples were collected and analyzed by the Applied Marine Research Laboratory at Old Dominion University for the determination of the concentration of tributyltin (TBT) at one station in the Hampton Roads Harbor area and eleven stations in the Elizabeth River area of the lower James River. The samples were collected during six monitoring events over the period of June 1993 to March 1995. In-stream concentrations were compared to the Virginia Water Quality Standard for TBT in saltwater surface waters (VR680-21-01.13) which are not to exceed 0.001 parts per billion (ug/l) TBT more than once every three years on average. The station in the Hampton Roads Harbor area did not exceed the standard. Six of the eleven stations in the Elizabeth River area exceeded the standard for TBT. The distribution of stations exceeding the TBT standard are as follows: three stations in the Elizabeth River main stem, one station in the Eastern Branch Elizabeth River, and two stations in the Southern Branch Elizabeth River. The exceedences occurred in segments that support considerable commercial vessel traffic with TBT hull coatings.

- Relationship between *Pfiesteria* and water quality

The 2002 water quality assessment included the sampling and analysis for a microorganism ***Pfiesteria piscicida***. This microorganism has been linked to extensive fish kills in North Carolina estuaries. Leading experts from North Carolina State University and the Florida Department of Environmental Protection as well as other scientists have not identified the toxic microbe in samples from Virginia. However, *Pfiesteria piscicida* was found in several rivers in Maryland where fish kills occurred during the summer of 1997. No confirmed cases were found in the waters of Virginia during the 1999 summer season and at this time, DEQ has reserved judgment on water quality issues associated with *Pfiesteria*.

Once a fish kill involving lesions is reported and if *Pfiesteria piscicida* is considered a possible cause, DEQ will collect water samples for oxygen and other chemical parameters along with actual fish samples. Water samples are sent to Old Dominion University (ODU) for analysis and fish samples are sent to Virginia Institute of Marine Science (VIMS).

- Reporting fish kills or fishes with lesions

DEQ has responsibility for investigating fish kills in Virginia waters. Call 1 (800) 592-54VA to be directed to the appropriate regional office.

For any health related concerns, call the VDH hotline at 1 (888) 238-6154.